IN THE SPECIFICATION:

At page 1, prior to line 3, please insert the following new paragraph and headings:

CROSS-REFERENCE TO RELATED APPLICATION

This is the U.S. National Stage of International Application Number PCT/FI2003/000763 filed October 15, 2003 and published in English on April 29, 2004 under International Publication Number WO 2004/036837 and claiming priority from Finnish application 20021832 filed October 15, 2002.

BACKGROUND OF THE INVENTION

1. Technical Field

At page 1, prior to line 8, please add the following heading and amend the paragraphs beginning on line 8 through page 2, line 2 as follows:

2. Discussion of Related Art

3GPP (3rd Generation Partnership Project) has recently published a specification for the 3GPP system comprising either UTRAN (UMTS Terrestrial Radio Access Network) or GERAN (GSM/EDGE Radio Access Network) as a radio access network. The specification defines a new broadcast/multicast service titled MBMS (Multimedia Broadcast/Multicast Service) [1]. MBMS basic architecture is illustrated in figure 1 wherein CBC (Cell Broadcast ~~Centre~~Center) 102, CSE (Camel Service Environment) 108, OSA/SCS (Open Service Access) 112 and related reference points can be considered as optional functionalities. Accordingly, mandatory components for realizing a MBMS service are described next in reference to [2].

The SGSN (Serving GPRS Support Node) 120 executes user specific service control functions, concentrates individual users of the same MBMS service into a single MBMS service and maintains a single connection with the source of the MBMS data. The SGSN 120 may also authenticate users and ~~authorise~~authorize the usage of services based on subscription data from the HLR (Home Location Register) 106.

The GGSN (Gateway GPRS Support Node) 122 terminates the MBMS GTP (GPRS Tunneling Protocol) tunnels from the SGSN 120 and links these tunnels via IP (Internet Protocol) multicast with the MBMS data source. The BM-SC (Broadcast/Multicast Service ~~Centre~~Center) 110 is an MBMS data source. The architecture also accepts other MBMS broadcast/multicast data sources and internal data sources 104 may directly provide their data. Data delivery by external sources 126 is controlled by Border Gateways (BG) 124 which may allow for example data from single addresses and ports to pass into the PLMN (Public Land Mobile Network) for delivery by an MBMS service. MBMS data may be scheduled in the BM-SC 110, for example, to be transmitted to the user every hour. It offers interfaces which can be utilized by a content provider 104, 114 in requesting data delivery to users. The BM-SC 110 may ~~authorise~~authorize and charge the content provider 104, 114. The Gmb reference point between BM-SC 110 and GGSN 122 enables the BM-SC 110 to exchange MBMS service control information with the GGSN 122. The Gmb reference point exists in order to carry the MBMS service information but it may not always be necessary to use the Gmb for each service. MBMS service can be delivered to user equipment (UE) 116, 128 such as a mobile terminal over GERAN 130 or UTRAN 118.

At page 2, please amend the paragraph beginning on line 14 as follows:

The SGSN 120 may use CAMEL (Customised Application for Mobile network Enhanced Logic) to handle pre-paid services, e.g. credit checking for on-line charging. The Cell Broadcast ~~Centre~~Center (CBC) 102 may be used to announce MBMS services to the users. The BM-SC 110 may exploit OSA-SCS 112 to interact with third parties. For the terminal split, MBMS shall be able to interoperate with an IP multicast client software on the terminal. More detailed information about MBMS service activation/release models, data transfer, functionalities of network elements, radio interface bearer set-up/release, QoS (Quality of Service), security issues etc. can be found in the references [1] and [2].

At page 2, please amend the paragraph beginning on line 4 as follows:

The Gb interface on the other hand connects the GERAN 130 to 2G SGSN 120 and the functional split between the BSS 130 (Base Station System, ~radio access network e.g. GERAN) and the SGSN 120 is different from the UTRAN/GERAN Iu mode. For example, ciphering is done in the core network (SGSN). Also the protocol

architecture illustrated in figure 3 being described more thoroughly later in the text and the procedures between the SGSN and the BSS differ from the Iu case.

At page 4, please add the following new heading on line 15 and amend the paragraph beginning on line 16 as follows:

DISCLOSURE OF INVENTION

An object of the present invention is to alleviate the aforesaid deficiencies and provide an addressing mechanism for routing MBMS data over the Gb interface between the SGSN 120 and BSS 130. Additionally, a flow control mechanism is needed for MBMS services as the bitrate they typically require may be relatively high and varying causing potential problems also for other traffic delivered by the BSS 130. The object is achieved by introducing a concept of ~~MBMS specific~~MBMS-specific packet flow context (PFC), called MBPFC (Multicast/Broadcast Packet Flow Context) hereinafter, to the Gb interface with functionalities partly corresponding the ones MBMS RAB provides in the Iu mode. The proposed concept thus allows reuse of some already-existing procedures and resolves certain Gb interface specific problems.

At page 5, prior to line 25, please add the following new heading:

BRIEF DESCRIPTION OF THE DRAWINGS

At page 6, please add the following heading prior to line 13 and amend the paragraph beginning on line 14 as follows:

BEST MODE FOR CARRYING OUT THE INVENTION

Figures 1-4 were already covered in conjunction with the description of the prior art. The signalling chart in figure 4 presenting the MBMS service activation is feasible also in this case ~~what~~when it comes to phases 402-414 preceding the RAB set-up.

At page 8, please amend the paragraphs beginning on line 9 through page 10, line 17 as follows:

Figures 5-7 disclose one option for enabling MBMS data routing and flow control between the SGSN 120 and BSS 130 in accordance with the invention. In a general sense, a procedure partly congruent with the PFC concept described above can be applied by creating a MBPFC for each MBMS service, a group of services or a group of terminals. From the SGSN's standpoint said group of terminals may, for example, belong to a same multicast group and reside behind a common BVC. The group, which typically contains at least two terminals, may receive data from a single source, e.g. an MBMS service, or from multiple sources. Occuring randomly it is still possible to have only one user (~one terminal) in the group though. In any case, the MBPFC is not logically connected to any individual terminal/associated with any individual TLLI (or TMSI / P-TMSI). ~~In~~In a multicast scenario the group for which the MBPFC is logically connected may be identified by a specific ID (e.g. a multicast ID). An MBMS specific PFI such as the multicast ID can also be sent to the terminals belonging to the multicast group for identifying the incoming MBMS flow. However, this may not be necessary as the identification can also be done in some other way (MBMS ID etc). The main use of an MBPFC is according to the invention to serve as an addressing mechanism between the SGSN 120 and the BSS 130 and facilitate using flow control in the Gb interface. In the BSS 130 the MBPFC is mapped to an appropriate logical channel so that the announced MBMS service is sent on the channel indicated to users in the service announcement procedure, wherein network broadcasts information e.g. about the frequency, time slot, and possibly TDMA frame when a particular service is scheduled over the radio interface.

The creation of an MBPFC can be executed as follows, see figure 5A. The SGSN 120 may initiate the procedure without any specific trigger from the BSS 130 side. For example, when the network establishes a new MBMS service or when the data is actually to be transferred the SGSN 120 initiates the creation of an MBPFC relating to the service/multicast group. This can be done in conjunction with the service announcement or later on. The SGSN 120 requests for the creation of the MBPFC by sending a CREATE-MBPFC PDU 504 to the BSS 130 including a PFI to be used for the PFC identification. The BSS 130 (in the GERAN case the network elements within the BSS executing this task are the RNCs), responds with a CREATE-MBPFC-ACK PDU 508 or corresponding NACK if the MBPFC cannot be created. As the proposed method ~~reminds~~is reminiscent of the one for creating a standard PFC with DOWNLOAD-BSS-PFC (optional), CREATE-BSS-PFC and CREATE-

BSS-PFC-ACK messages, the existing standard procedure can also be exploited in this MBMS specific case, anyhow recalling that the essential difference is founded on a fact that the MBPFC is not logically connected to an individual terminal unlike the standard PFC. The network maps the PFC/PFI to a MBMS service/multicast group and it is also possible, although not advisable, to position all MBMS services into a single MBPFC. In that case different services cannot be treated independently and they may delay each other etc. The SGSN 120 and BSS 130 maintain entities, e.g. memory tables, of existing MBMS service/multicast group<->PFC/PFI mappings in order to route and control the flow of the data to be transferred and, in the BSS 130, to further pass the received data over an appropriate (e.g. announced) logical channel to terminal(s) either as a broadcast or PTM (Point-To-Multipoint, e.g. multicast) transmission.

At page 10, please amend the paragraph beginning on line 6 as follows:

The SGSN 120 shall preferably perform flow control on each BVC, on each MBPFC and on some/all MBMS services as a whole, see figure 7. The flow control is performed first on each LLC-PDU (to be included in a UNITDATA PDU) by an MBPFC specific flow control mechanism 702, then by an aggregate flow control mechanism 704 and finally by a BVC flow control mechanism 706. BVC flow control (typically corresponding a cell) parameters concerning both standard PFCs as well as MBPFCs are received from the BSS 130 in a FLOW-CONTROL-BVC PDU described in the reference [4]. MBPFC flow control parameters can in principle be received from the BSS in a FLOW-CONTROL-PFC message as in a normal PFC case but the binding of the PFC with an individual terminal does not naturally apply. However, the BSS 130 may, for example, estimate an average profile of terminals receiving the services and inform the profile or relating parameters to the SGSN 120 for derivation of MBPFC specific flow control definitions. On the other hand, a set of rules may have been programmed in the BSS 130 indicating desired parameters (e.g. limit values for data leakage) for receiving services of varying ~~type~~types and based on that information, provide MBPFC specific parameters to the SGSN 120. As an third option, the SGSN 120 may define MBPFC flow control parameters based on some service related data or its current status (e.g. load). An entity called MBMS service block 708 may be created, under which there would be a number of MBPFCs carrying different MBMS services, to form an aggregate flow control level 704 comprising at least one block 708 but one option is to perform only PFC and BVCI

flow control resulting that the aggregate level 704 in figure 7 does not exist. Secondly, if only a single PFC is created for all MBMS services as mentioned earlier, the situation remains the same. The SGSN 120 may construct the MBMS service blocks 708 by, for example, dividing the MBMS services into a number of groups (linked to blocks) based on the information about service/content type, content provider and service delivery requirements. This information, which can also be utilized in the creation of MBPFC flow control definitions, may be received, from a network element like the GGSN 122 or it can be derived internally either explicitly or implicitly from the MBMS data or relating ancillary information.

At page 11, please amend the paragraph beginning on line 16 as follows:

The scope of the invention is disclosed in the following independent claims. However, utilized messages, network elements, method and ~~procedure steps etc~~procedural steps, etc., may vary depending on the current scenario, still converging to the basic ideas of the invention. Therefore, the invention is not strictly limited to the embodiments described above.

At page 12, please amend the reference beginning on line 2 as follows:

[1] 3GPP TS ~~22.146~~22.146 V6.0.0 Technical Specification Group Services and System Aspects; Multimedia Broadcast/Multicast Service; Stage 1 Release 6 (2002-6), URL: http://www.3gpp.org, 3GPP 2002